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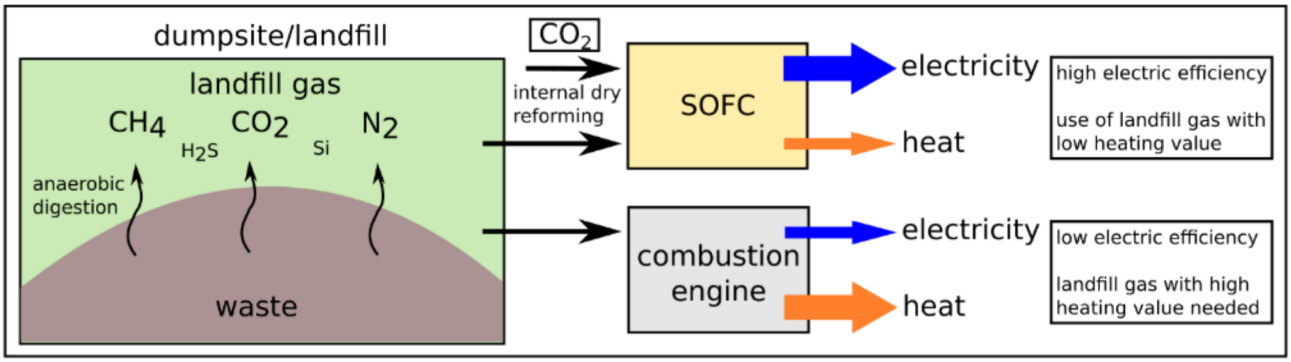
Abstract



One option to utilize landfill gas with a low heating value and to increase the electrical efficiency could be the use of solid oxide fuel cells (SOFCs). SOFCs are able to convert hydrogen or carbon containing fuels like landfill gas directly into electricity and byproduct heat. To prevent degradation of the SOFC it is important to avoid carbon formation. Therefore, a reforming agent like steam or carbon dioxide (dry reforming) is necessary. Landfill gas has the advantage that it contains a certain amount of the needed carbon dioxide already. Furthermore, a pre-cleaning of landfill gas might be required to avoid high degradation rates due to impurities in the landfill.

In the present work, planar 16 cm^2 SOFC cells were operated at 750 ˚C for a few hundred hours with real landfill gas from one of the largest Danish landfill sites, with an additional carbon dioxide reforming agent. The cell performance was analyzed and compared in galvanostatic vs potentiostatic operation modes and with vs without gas cleaning through an activated carbon filter.

In both the galvanostatic and potentiostatic operation modes, no significant changes in the power output were observed when the filter was used. When gas cleaning was not used, both operation modes showed a decline in the power output. After the first 40 hours the power density had dropped by ~0.034 W/cm^2 in the galvanostatic operation mode and by ~0.18 W/cm^2 in the potentiostatic mode.